

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Application Of: Walter H. Delashmit, Jr., <i>et al.</i>  Serial No.: 10/758,452  Filed: January 15, 2004  For: Method And Apparatus For Developing Synthetic Three-Dimensional Models From Imagery	Group Art Unit: 2128  Examiner: Cuong V. Luu  Atty. Dkt. No.: 2063.007100  Client Docket: VS-00650  Confirmation No.: 5621
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**APPEAL BRIEF**

Commissioner for Patents  
 PO Box 1450  
 Alexandria, VA 22313-1450

Sir:

Applicants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated March 9, 2007.

The fee for filing this Appeal Brief is \$500, and the Commissioner is authorized to deduct or credit said fees from or to Williams, Morgan & Amerson Deposit Account No. 50-0786 (2063.007100).

**I. REAL PARTY IN INTEREST**

Lockheed Martin Corporation, the assignee hereof, is the real party in interest.

**II. RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences of which Applicants, Applicants' legal representative, or the Assignee are aware that will directly affect or be directly affected by or have a bearing on the decision in this appeal.

### III. STATUS OF THE CLAIMS

Claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 are pending in the case, claims 3, 5-6, 8-9, 12-15, 21-22, 47-51, and 56-57 having been canceled and claims 64-84 having been added during the prosecution. The “final” Office Action rejected:

- claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 as obvious under 35 U.S.C. §103 over U.S. Publication No. 2003/0071194 (“Mueller, *et al.*”)<sup>1</sup> in combination with allegedly admitted prior art from Applicants’ specification; and
- claims 74-75 under 35 U.S.C. §112, ¶2 for lack of antecedent basis.

Applicants appeal from each of the rejections.

### IV. STATUS OF AMENDMENTS

A response to the “final” Office Action is filed herewith, requesting amendments to claim 73 that should overcome the rejections of claims 74-75, if granted. Since it is filed herewith, the Office has not yet had a chance to consider it. Since prosecution is closed on the merits, Applicants cannot amend the claims as of right. Applicants argue in this appeal as though the amendments might be refused or the Office might take the position that the amendments do not overcome the rejection.

### V. SUMMARY OF CLAIMED SUBJECT MATTER

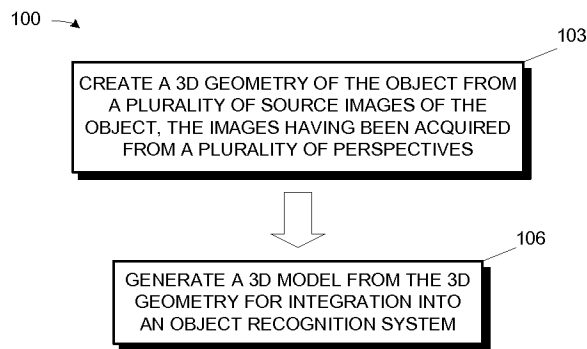
The present invention pertains to software modeling of objects, and, more particularly, to a method and apparatus for developing synthetic three-dimensional models from imagery. ¶[0001] The invention, in its various aspects and embodiments, includes a method and apparatus for modeling an object in software. ¶[0002] The method comprises generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives; and generating a three-dimensional model from the three-dimensional geometry for integration into an object

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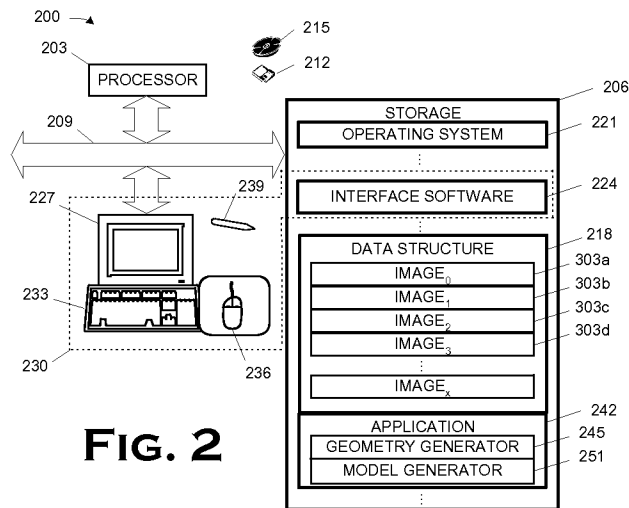
<sup>1</sup> Applicants do not concede that Mueller *et al.* is in fact prior art. Mueller *et al.* is a publication, not an issued patent, and was published less than one year before Applicants’ filing date. Thus, it is available as “prior art” under 35 U.S.C. §102 only through the legal fiction that Applicants’ date of invention coincides with their date of filing such that Mueller *et al.* was invented prior to the present invention. Accordingly, Applicants reserve the right to swear behind Mueller *et al.*

recognition system. *Id.* The apparatus may be a program storage medium encoded with instructions that, when executed by a computer, perform such a method or a computer programmed to perform such a method. *Id.*

**FIG. 1**, reproduced below, illustrates a method 100 for modeling an object in software in accordance with the present invention. ¶[0032] The method 100 is largely software implemented on a computing apparatus, such as the computing apparatus 200 illustrated in **FIG. 2**, also reproduced below. ¶[0033] **FIG. 2** depicts, in a block diagram, selected portions of the computing apparatus 200, including a processor 203 communicating with storage 206 over a bus system 209. *Id.* The storage 206 is encoded with an application 242 that is invoked by the processor 203 under the control of the operating system 221 or by the user through the operator interface 230. *Id.* The user interacts with the application 242 through the user interface 230 to input information on which the application 242 acts to generate the synthetic 3D model. *Id.*



**FIG. 1**

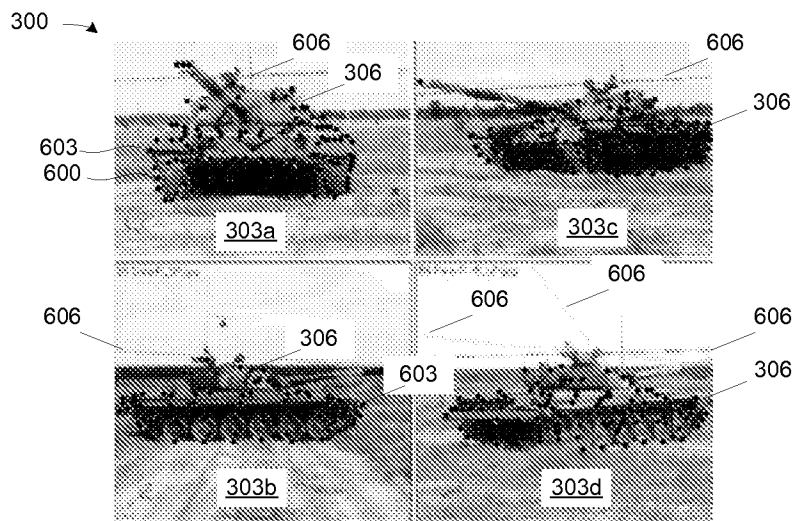


**FIG. 2**

More particularly, the method 100 comprises first creating (at 103) a three-dimensional (“3D”) geometry of the object from a plurality of source images of the object, the images having been acquired from a plurality of perspectives. ¶[0032] Next, the method 100 generates (at 106) a synthetic 3D model from the three-dimensional geometry for integration into an object recognition system. *Id.* The 3D model is “synthetic” in that it is not developed from the object itself, but rather some representation of that object. *Id.*

More particularly, the method 100 creates (at 103) a 3D geometry of the object 306 from the source images 303a – 303d of the object, shown in **FIG. 6**, reproduced below. ¶[0042] In the illustrated embodiment, this is performed in a two step process 400, illustrated in **FIG. 4**.

A preliminary geometry is first constructed (at 403) to define a 3D space. ¶[0042] As shown in **FIG. 5**, this can be done by selecting (at 503) a plurality of points 600 in each of the source images 303a – 303d, as shown **FIG. 6**. ¶[0043] The relationship(s) between/among the images is/are calibrated (at 506) from selected points that are co-located in more than one of the images 303a – 303d. ¶[0043] The selected points in the calibrated two-dimensional images are then mapped (at 509) into a three-dimensional space 703, shown in **FIG. 7**. ¶[0043], ¶[0045]-[0049] Some rough object, or “preliminary” geometries are shown in **FIG. 8**. ¶[0050]



**FIG. 6**

A final geometry is then developed (at 406) in that 3D space 703. ¶[0042] Generating (at 406) the final geometry includes selecting additional points 600, shown in **FIG. 6**, in the source images 303a – 303d as described above and then mapping them into the 3D space 703, also as described above. ¶[0052] The additional selected points 600 and their mapping into the 3D space 703 fleshes out the rough geometry previously generated (at 403) to provide higher fidelity to the object 306. ¶[0052]

Returning now to **FIG. 1**, once the 3D geometry is developed (at 103), the method 100 generates (at 106) a synthetic 3D model from the 3D geometry for integration into an object recognition system. **FIG. 12** illustrates a two-part process 1200 for generating a synthetic 3D model from the 3D geometry. ¶[0053] The process 1200 first rotates (at 1203) the 3D geometry ¶[0053] then generates (at 1206) a plurality of synthetic signatures of the synthetic 3D model from a plurality of perspectives as the 3D geometry is rotated ¶¶[0053], [0054]-[0080]. Note that the synthetic 3D model rotation (at 1203) and the synthetic signature generation (at 1206) are performed by the application 242, shown in **FIG. 2**, autonomously, *i.e.*, without human intervention or interaction. [0053]

Turning now to the language of the claims, with respect to claim 1, a method (*e.g.*, 100, **FIG. 1**; [0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; [0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; [0032], [0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, [0040]); and
- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶¶[0032], [0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶¶[0004]-[0006]; 1700, **FIG. 17**; ¶¶[0098]-[0103]).

With respect to claim 24, a program storage medium (*e.g.*, 212, 215, 206, **FIG. 2**; [0034]) encoded with instructions that, when executed by a computer (*e.g.*, 200, **FIG. 2**; ¶¶[0033]-[0037]), perform a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]); and

- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶[0004]-[0006]; 1700, **FIG. 17**; ¶[0098]-[0103]).

With respect to claim 34, a programmed computer, the invention comprises:

- (a) a processor (*e.g.*, 203, **FIG. 2**; ¶[0033]);
- (b) a bus system (*e.g.*, 209, **FIG. 2**; ¶[0033]);
- (c) a storage (*e.g.*, 206, **FIG. 2**; ¶[0034]) with which the processor communicates over the bus system; and
- (d) a software application (*e.g.*, 242, **FIG. 2**; ¶[0036]) residing in the storage and capable of performing a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software upon invocation by the processor, the method comprising:
  - (i) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]); and
  - (ii) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶[0004]-[0006]; 1700, **FIG. 17**; ¶[0098]-[0103]).

With respect to claim 44, a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) creating a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶[0050]-[0051]) of the object from a plurality of two-dimensional images (*e.g.*, 303a-303d, **FIG. 3**; ¶[0038]-[0039]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]); and

- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶[0004]-[0006]; 1700, **FIG. 17**; ¶[0098]-[0103]).

With respect to claim 64, a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]), including:
  - (i) generating (*e.g.*, 403, **FIG. 4**; **FIG. 5-FIG. 9**; ¶[0042]-[0051]) a preliminary three-dimensional geometry from object from the images to define a three-dimensional space (*e.g.*, 703, **FIG. 7**); and
  - (ii) generating (*e.g.*, 406, **FIG. 4**; ¶[0052]) the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and
- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶[0004]-[0006]; 1700, **FIG. 17**; ¶[0098]-[0103]).

With respect to claim 70, a program storage medium (*e.g.*, 212, 215, 206, **FIG. 2**; ¶[0034]) encoded with instructions that, when executed by a computing device (*e.g.*, 203, **FIG. 2**; ¶[0033]), perform a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]), including:

- (i) generating (*e.g.*, 403, **FIG. 4**; **FIG. 5-FIG. 9**; ¶[0042]-[0051]) a preliminary three-dimensional geometry from object from the images to define a three-dimensional space (*e.g.*, 703, **FIG. 7**); and
  - (ii) generating (*e.g.*, 406, **FIG. 4**; ¶[0052]) the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and
- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶[0004]-[0006]; 1700, **FIG. 17**; ¶[0098]-[0103]).

With respect to claim 73, a computer (*e.g.*, 200, **FIG. 2**; ¶[0033]-[0037]), the invention comprises:

- (a) a processor (*e.g.*, 203, **FIG. 2**; ¶[0033]);
- (b) a bus system (*e.g.*, 209, **FIG. 2**; ¶[0033]);
- (c) a storage (*e.g.*, 206, **FIG. 2**; ¶[0034]) with which the processor communicates over the bus system; and
- (d) a software application (*e.g.*, 242, **FIG. 2**; ¶[0036]) residing in the storage and capable of performing a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software upon invocation by the processor, the method comprising:
  - (i) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]), including:
    - (A) generating (*e.g.*, 403, **FIG. 4**; **FIG. 5-FIG. 9**; ¶[0042]-[0051]) a preliminary three-dimensional geometry from object from the images to define a three-dimensional space (*e.g.*, 703, **FIG. 7**); and



- (B) generating (*e.g.*, 406, **FIG. 4**; ¶[0052]) the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and
- (ii) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶¶[0004]-[0006]; 1700, **FIG. 17**; ¶¶[0098]-[0103]).

With respect to claim 76, a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]); and
- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) of a LADAR return from the three-dimensional geometry for integration into an object recognition system (*e.g.*, ¶¶[0004]-[0006]; 1700, **FIG. 17**; ¶¶[0098]-[0103]).

With respect to claim 79, a program storage medium (*e.g.*, 212, 215, 206, **FIG. 2**; ¶[0034]) encoded with instructions that, when executed by a computing device (*e.g.*, 203, **FIG. 2**; ¶[0033]), perform a method (*e.g.*, 100, **FIG. 1**; ¶[0032]) for modeling an object (*e.g.*, 306, **FIG. 3**; ¶[0037]) in software, the invention comprises:

- (a) generating (*e.g.*, 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (*e.g.*, 800, **FIG. 8**; ¶¶[0050]-[0051]) of the object from a plurality of points (*e.g.*, 600, **FIG. 6**; ¶¶[0045]-[0046]) obtained from a plurality of images (*e.g.*, 303a-303d, **FIG. 3**; ¶¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (*e.g.*, ¶[0040]); and
- (b) generating (*e.g.*, 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (*e.g.*, 1200, **FIG. 12**; ¶[0053]) of a LADAR return from the

three-dimensional geometry for integration into an object recognition system (e.g., ¶¶[0004]-[0006]; 1700, **FIG. 17**; ¶¶[0098]-[0103]).

With respect to claim 82, a programmed computer, the invention comprises:

- (a) a processor (e.g., 203, **FIG. 2**; ¶[0033]);
- (b) a bus system (e.g., 209, **FIG. 2**; ¶[0033]);
- (c) a storage (e.g., 206, **FIG. 2**; ¶[0034]) with which the processor communicates over the bus system; and
- (d) a software application (e.g., 242, **FIG. 2**; ¶[0036]) residing in the storage and capable of performing a method (e.g., 100, **FIG. 1**; ¶[0032]) for modeling an object (e.g., 306, **FIG. 3**; ¶[0037]) in software upon invocation by the processor, the method comprising:
  - (i) generating (e.g., 103, **FIG. 1**; 400, **FIG. 4**; ¶[0032], ¶[0042]) a three-dimensional geometry (e.g., 800, **FIG. 8**; ¶¶[0050]-[0051]) of the object from a plurality of points (e.g., 600, **FIG. 6**; ¶¶[0045]-[0046]) obtained from a plurality of images (e.g., 303a-303d, **FIG. 3**; ¶¶[0037]-[0041]) of the object, the images having been acquired from a plurality of perspectives (e.g., ¶[0040]), including:
  - (ii) generating (e.g., 106, **FIG. 1**; 1200, **FIG. 12**; ¶[0032], ¶[0053]) a three-dimensional model (e.g., 1200, **FIG. 12**; ¶[0053]) of a LADAR return from the three-dimensional geometry for integration into an object recognition system (e.g., ¶¶[0004]-[0006]; 1700, **FIG. 17**; ¶¶[0098]-[0103]).

Note that the references set forth above are to the disclosed embodiment(s) for illustrative purposes as required by rule and do not limitation the claims.

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

A. Whether claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 are obvious under 35 U.S.C. §103 over U.S. Publication No. 2003/0071194 (“Mueller, *et al.*”) in combination with allegedly admitted prior art from Applicants’ specification.

B. Whether claims 74-75 are indefinite under 35 U.S.C. §112, ¶2 for lack of antecedent basis.

## VII. ARGUMENT

Claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 are pending in the case. The Office rejected each of the claims as follows:

- claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 as obvious under 35 U.S.C. §103 over U.S. Publication No. 2003/0071194 (“Mueller, *et al.*”) in combination with allegedly admitted prior art from Applicants’ specification; and
- claims 74-75 under 35 U.S.C. §112, ¶2 for lack of antecedent basis.

Applicants appeal from each of the rejections. As is set forth below, each of the rejections is erroneous and should be REVERSED.

### A. CLAIMS 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, AND 58-84 ARE NOT OBVIOUS OVER THE ART OF RECORD

The Office Action rejected claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 as obvious under 35 U.S.C. §103 over U.S. Publication No. 2003/0071194 (“Mueller, *et al.*”) in combination with allegedly admitted prior art from Applicants’ specification. Applicant respectfully submits that these rejections fail because:

- Mueller *et al.* is non-analogous art;
- Mueller *et al.* teaches away; and
- Mueller *et al.* and the allegedly admitted prior art are improperly combined.

Each of these positions will now be developed in turn.

#### 1. Mueller *et al.* is Non- Analogous Art

Mueller *et al.* is from a non-analogous art and therefore may not be properly cited against the present invention. "Two criteria have evolved for determining whether prior art is analogous: (1) ¶[W]hether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *In re Clay*, 966 F.2d 656, 658-59 (Fed. Cir. 1992) (reversing Board holding of obviousness).

Mueller *et al.* is clearly is not from the same field of endeavor as the invention. Applicants' invention is a technique for generating synthetic 3D models for embedment in an ATR. (Delashmit & Jack, ¶[0002]) Mueller *et al.*, on the other hand, teaches a technique for achieving color fidelity in a scanned, 2D image of a 3D object. (Mueller *et al.*, ¶[0003]) Thus, on the face of the application and Mueller *et al.*, they are not from the same field of endeavor.

Mueller *et al.* furthermore is not “reasonably pertinent” to the Applicants’ problem:

A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem. Thus, the purposes of both the inventor and the prior art are important in determining whether the reference is reasonably pertinent to the problem the invention attempts to solve. If a reference disclosure has the same purpose as the claimed invention, the reference relates to the same problem, and that fact supports use of that reference in an obviousness rejection. An inventor may well have been motivated to consider the reference when making his invention. If it is directed to a different purpose, the inventor would accordingly have less motivation or occasion to consider it.

*In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992).

Applicants were addressing the difficulty of developing synthetic 3D images of vehicles for use in an automatic target recognition (“ATR”) system. (Delashmit & Jack, ¶[0003] – ¶[0009]) More particularly, Applicants were addressing the difficulty posed in the prior art by having to have the vehicle present. (*Id.*, especially ¶[0009]) Mueller *et al.* is about getting the color correct in a two-dimensional, scanned image of a three-dimensional object. (Mueller *et al.*, ¶[0004] – ¶[0009]) These are two very different purposes, and “the inventor(s) would accordingly have less motivation or occasion to consider it.” *Clay*, 966 F.2d at 659. There is no reason to seek a 3D synthetic modeling technique for a 3D object for embedment in an ATR in a reference on producing correct color in a two-dimensional scanned image.

In the “final” Office Action, the Office argues that Mueller *et al.* is “definitely analogous”:

Mueller teaches an invention that develops a 3-D image of an object from a plurality of scanned images (pp. 1-2 paragraph 0011), and the Applicant’s admitted prior art, hereinafter the

AAPA, teaches generating geometrical model of an object for integration into an ATR system (specification's p. 1, paragraphs 0004 and 0006). It would have been obvious to one of ordinary skill in the art to combine the teachings of Mueller and AAPA. AAPA's teachings would have provided the ability to automatically, and quickly view and classify objects (AAPA, p. 1, paragraph 0004). Therefore, these two are definitely analogous.

The most obvious flaw in this position is that it is predicated on what the references teach, *which only becomes relevant once it is determined that Mueller et al. is within the scope and content of the prior art*, and therefore manifests the exercise of hindsight.

Thus, Mueller *et al.* is not within Applicants' field of endeavor and the Office has not alleged to the contrary. The Office has posited that Mueller *et al.* is reasonably pertinent to Applicants' endeavor to be a part of the prior art, but that position is based on impermissible, hindsight considerations. The Office has therefore failed to properly establish that Mueller *et al.* is within the scope and content of the prior art and, Applicants respectfully submit, it is not.

## **2. Mueller et al. Teaches Away**

To the extent that the Office maintains that Mueller *et al.* is within the scope and content of the prior art, it teaches away. While Mueller *et al.* does teach that data image acquisition can be done remotely (§[0052]), it subsequently indicates that this is very undesirable for a whole variety of problems. More particularly, Mueller *et al.* teaches that it is very desirable to achieve a high degree of integration in the equipment—*i.e.*, the processing system and the image processor. (§[0117], §[0119]–[0121]) This necessarily implies that Mueller *et al.* is teaching that it is more preferable to bring the scanned object to the equipment in which the data will be processed.

Thus, Mueller *et al.* teaches that circumstance which is precisely the problem Applicants are trying to overcome is the preferable approach. Indeed, one circumstance that the present invention seeks to address is the situation in which the object to be modeled cannot actually be brought to the equipment that is to do the modeling. (§[0008]) Mueller *et al.* therefore teaches away from Applicants' invention. It is by now well established that teaching away by the prior art constitutes *prima facie* evidence that the claimed invention is not obvious. *See, inter alia, In re Fine*, 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Nielson*, 2 U.S.P.Q.2d (BNA) 1525, 1528 (Fed. Cir. 1987); *In re Hedges*, 228 U.S.P.Q. (BNA) 685, 687 (Fed. Cir. 1986).

The Office also disputes this point. The Office believes that Mueller *et al.* does not teach away because:

The claimed invention only claims method and apparatus to generate 3-D images from a plurality of images for integration into an ATR system. Mueller teaches generating 3-D models from a plurality of images but does not teach integrating the 3-D images into an ATR system, and the AAPA teaches integrating images into an ATR system. It would have been obvious to one of ordinary skill in the art to combine the teachings of Mueller and AAPA. AAPA's teachings would have provided the ability to automatically, and quickly view and classify objects (AAPA, p1, paragraph 0004). Hence, the two references complement each other not disagreeing with each other.

This reasoning also contains numerous flaws, including:

- (1) the invention does not teach generating 3D images for integration into an ATR. Rather, the present invention generates 3D models for integration into an ATR, the 3D models being derived from images. (*see* **FIG. 1**)
- (2) Mueller *et al.* does not teach generating 3D models from images, but rather a technique for achieving color fidelity in a scanned, 2D image of a 3D object. (Mueller *et al.*, ¶[0003])
- (3) the alleged AAPA teaches integrating geometries—not images—into an ATR. (¶[0006])
- (4) the alleged AAPA teaches nothing about images.

Note, also, that:

- the Office's misconstruction in (1) above demonstrates the Office's misunderstanding of what the present invention actually is.
- the Office's selective construction of Mueller *et al.* shows that the Office has taken the teachings relied upon out of context and has selectively identified those teachings in hindsight.
- the Office's misconstructions in (3) and (4) above demonstrates the Office's misunderstanding of what the alleged AAPA teaches.

Thus, while doing nothing to refute the Applicants' position, the Office has clearly demonstrated that it does not understand the invention, that it does not understand the alleged AAPA, and that it has exercised hindsight in its application of Mueller *et al.*

### **3. Mueller *et al.* and the Allegedly Admitted Prior Art are Improperly Combined**

The Office apparently is citing the discussion in Applicants' specification at ¶¶[0004] – [0009] (“AAPA”) and then combines it with the teachings of Mueller *et al.* On this combination, the Office asserts that a three dimensional software model developed as claimed and embedded in an automatic target recognition (“ATR”) system would have been obvious. However, the Office has improperly combined the AAPA and the teachings of Mueller *et al.*

As was established above, Mueller *et al.* is not prior art and, to the extent that the Office maintains that Mueller *et al.* is within the scope and content of the prior art, it teaches away from the present invention. There can be no motivation or suggestion to combine references as a matter of law where one of the references teaches away from the claimed invention. *In re Fine*, 5 U.S.P.Q.2d (BNA) 1596, 1599 (Fed. Cir. 1988); *In re Gordon*, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984).

The Office disputes this position as well. Inasmuch as Applicants' position on this issue is predicated on the fact that Mueller *et al.* is not prior art and teaches away, the Office relies on its disputation of those facts in its opposition. However, as set forth above, those disputations pretty much only show that the Office understands neither the invention nor the alleged AAPA while exercising hindsight in its application of Mueller *et al.*

### **4. Conclusion on Obviousness**

The obviousness rejections therefore err because Mueller *et al.* is non-analogous art; Mueller *et al.* teaches away; and Mueller *et al.* and the allegedly admitted prior art are improperly combined. As is established above, the Office's responses to those arguments only confirm that the Office does not understand the invention, does not understand the alleged AAPA, and has exercised hindsight in its application of Mueller *et al.*

Applicants therefore pray that the rejections be REVERSED.

### **B. CLAIMS 75-75 ARE DEFINITE**

The Office rejected claims 74-75 under 35 U.S.C. §112, ¶2 for lack of antecedent basis. Claims 74 and 75 both recite that the computer of claim 73, from which they depend, is programmed. The Office alleges that this limitation is not first recited in claim 73. Although not

so stated, the Office presumably believes the alleged lack of antecedent basis renders the claims indefinite.

Applicants respectfully disagree. The claims are definite under the rule that “[i]nherent components of elements recited have antecedent basis in the recitation of the components themselves.” M.P.E.P. §2173.05(e). Claim 73 expressly recites a computer including a software application that resides on the storage and is invoked by the processor. A computer storing executable software in its memory is “programmed”. This fact is so widely known that Applicants request the Board to take judicial notice pursuant to M.P.E.P. §2144.03. Accordingly, claims 74-75 are definite because claim 73 does, in fact, provide sufficient antecedent basis for the subject limitation.

Applicants therefore pray that these rejections be REVERSED.

### **C. CONCLUDING ARGUMENT**

Applicants respectfully submit that the claims are in condition for allowance over the art of record. The response to the “final” Office Action filed herewith should moot the indefiniteness rejections, but the claims are definite anyway. A fuller, more accurate understanding of the invention and the art of record will furthermore show that the obviousness rejections are improvident as well. Accordingly, Applicants pray that all rejections be REVERSED and that the claims be allowed to issue.

## **VIII. CLAIMS APPENDIX**

The claims that are the subject of the present appeal claims 1-2, 4, 7, 10-11, 16-20, 23-46, 52-55, and 58-84 are set forth in the attached “Claims Appendix”.

## **IX. EVIDENCE APPENDIX**

There is no separate Evidence Appendix for this appeal.

## **X. RELATED PROCEEDINGS APPENDIX**

There is no Related Proceedings Appendix for this appeal.



## **XI. CONCLUSION**

Applicants respectfully submit that the application is in condition for allowance. Applicants therefore request that all the rejections be REVERSED and that the application be allowed to issue.

Respectfully submitted,

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WILLIAMS, MORGAN & AMERSON  
10333 Richmond Dr., Suite 1100  
Houston, Texas 77042  
(713) 934-4053 ph

/Jeffrey A. Pyle/  
Jeffrey A. Pyle  
Reg. No. 34,904  
Attorney for Applicants

**APPENDIX**  
**(Claims in Issue)**

1. A method for modeling an object in software, comprising:  
generating a three-dimensional geometry of the object from a plurality of points obtained  
from a plurality of images of the object, the images having been acquired from a  
plurality of perspectives; and  
generating a three-dimensional model from the three-dimensional geometry for  
integration into an object recognition system.
2. The method of claim 1, wherein generating the three-dimensional geometry includes  
generating the three-dimensional geometry of the object from a plurality of points obtained from  
a plurality of two-dimensional images of the object.
4. The method of claim 2, wherein generating the three-dimensional geometry includes:  
selecting a plurality of points in each of the two-dimensional images;  
calibrating the relationship between the images from selected points that are co-located in  
more than one of the two-dimensional images; and  
mapping the selected points in the calibrated two-dimensional images into a three-  
dimensional space.
7. The method of claim 4, wherein mapping the selected points into the three-dimensional  
space includes:

defining the three-dimensional space from the calibrated relationships between the images; and

placing the selected points into the three-dimensional space using the co-located points as references between the images.

10. The method of claim 1, wherein generating the three-dimensional geometry includes generating a plurality of surface geometries for the object from three-dimensional data generated from the images.

11. The method of claim 10, wherein generating the surface geometries includes connecting the three-dimensional data to planar curves.

16. The method of claim 1, wherein generating the three-dimensional model from the three-dimensional geometry includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.

17. The method of claim 16, where generating the synthetic signatures comprises generating a plurality of synthetic LADAR signatures.

18. The method of claim 1, wherein the images comprise three-dimensional images.

19. The method of claim 1, wherein the images comprise two-dimensional images.
20. The method of claim 1, wherein the images comprise at least one of photographic images, laser radar images, synthetic aperture radar images, drawings, and infrared images.
23. The method of claim 1, wherein generating the three-dimensional model for integration into the object recognition system includes generating the three-dimensional model for integration into a target recognition system.
24. A program storage medium encoded with instructions that, when executed by a computer, perform a method for modeling an object in software, the method comprising:
- generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives; and
  - generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.
25. The program storage medium of claim 24, wherein generating the three-dimensional geometry in the encoded method includes generating the three-dimensional geometry of the object from a plurality of points obtained from a plurality of two-dimensional images of the object.

26. The program storage medium of claim 24, wherein generating the three-dimensional geometry in the encoded method includes generating a plurality of surface geometries for the object from three-dimensional data generated from the images.

27. The program storage medium of claim 24, wherein generating a three-dimensional geometry in the encoded method includes:

generating a preliminary three-dimensional geometry from object from the images to  
define a three-dimensional space; and

generating a final three-dimensional geometry from the images, the final three-dimensional geometry being defined within the three-dimensional space.

28. The program storage medium of claim 24, wherein generating the three-dimensional model from the three-dimensional geometry in the encoded method includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives  
at the three-dimensional geometry is rotated.

29. The program storage medium of claim 24, wherein the images comprise three-dimensional images.

30. The program storage medium of claim 24, wherein the images comprise two-dimensional images.

31. The program storage medium of claim 24, wherein the images comprise at least one of photographic images, laser radar images, synthetic aperture radar images, drawings, and infrared images.

32. The program storage medium of claim 24, wherein generating the three-dimensional model in the encoded method includes generating a three-dimensional model of LADAR returns from the object.

33. The program storage medium of claim 24, wherein generating the three-dimensional model for integration into the object recognition system in the encoded method includes generating the three-dimensional model for integration into a target recognition system.

34. A programmed computer, comprising:

a processor;

a bus system;

a storage with which the processor communicates over the bus system; and

a software application residing in the storage and capable of performing a method for modeling an object in software upon invocation by the processor, the method comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives; and

generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.

35. The computer of claim 34, wherein generating the three-dimensional geometry in the programmed method includes generating the three-dimensional geometry of the object from a plurality of points obtained from a plurality of two-dimensional images of the object.

36. The computer of claim 34, wherein generating the three-dimensional geometry in the programmed method includes generating a plurality of surface geometries for the object from three-dimensional data generated from the images.

37. The computer of claim 34, wherein generating a three-dimensional geometry in the programmed method includes:

generating a preliminary three-dimensional geometry from object from the images to define a three-dimensional space; and  
generating a final three-dimensional geometry from the images, the final three-dimensional geometry being defined within the three-dimensional space.

38. The computer of claim 34, wherein generating the three-dimensional model from the three-dimensional geometry in the programmed method includes:

rotating the three-dimensional geometry; and  
generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.

39. The computer of claim 34, wherein the images comprise three-dimensional images.
40. The computer of claim 34, wherein the images comprise two-dimensional images.
41. The computer of claim 34, wherein the images comprise at least one of photographic images, laser radar images, synthetic aperture radar images, drawings, and infrared images.
42. The computer of claim 34, wherein generating the three-dimensional model in the programmed method includes generating a three-dimensional model of LADAR returns from the object.
43. The computer of claim 34, wherein generating the three-dimensional model for integration into the object recognition system in the programmed method includes generating the three-dimensional model for integration into a target recognition system.
44. A method for modeling an object in software, comprising:  
creating a three-dimensional geometry of the object from a plurality of two-dimensional images of the object, the images having been acquired from a plurality of perspectives; and  
generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.



45. The method of claim 44, wherein creating the three-dimensional geometry includes generating a set of three-dimensional data from a set of two-dimensional data representing the two-dimensional images.

46. The method of claim 45, wherein generating the set of three-dimensional data includes:  
selecting a plurality of points in each of the two-dimensional images;  
calibrating the relationship between the images from selected points that are co-located in  
more than one of the two-dimensional images; and  
mapping the selected points in the calibrated two-dimensional images into a three-dimensional space.

52. The method of claim 44, wherein creating the three-dimensional geometry includes generating a plurality of surface geometries for the object from three-dimensional data generated from the images.

53. The method of claim 52, wherein generating the surface geometries includes connecting the three-dimensional data to planar curves.

54. The method of claim 44, wherein creating the three-dimensional geometry includes:  
generating a preliminary three-dimensional geometry from object from the images to  
define a three-dimensional space; and  
generating a final three-dimensional geometry from the images, the final three-dimensional geometry being defined within the three-dimensional space.

55. The method of claim 54, wherein generating the preliminary three-dimensional geometry includes:

selecting a plurality of points in each of the two-dimensional images;

calibrating the relationship between the images from selected points that are co-located in more than one of the two-dimensional images; and

mapping the selected points in the calibrated two-dimensional images into the three-dimensional space.

58. The method of claim 44, wherein generating the three-dimensional model from the three-dimensional geometry includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.

59. The method of claim 58, where generating the synthetic signatures comprises generating a plurality of synthetic LADAR signatures.

60. The method of claim 44, wherein the two-dimensional images comprise at least one of photographic images, laser radar images, synthetic aperture radar images, drawings, and infrared images.

61. The method of claim 44, wherein generating the three-dimensional model includes generating a three-dimensional model of LADAR returns from the object.

62. The method of claim 61, wherein generating the three-dimensional model of the LADAR returns for integration into the object recognition system includes generating the three-dimensional model of the LADAR returns for integration into a target recognition system.

63. The method of claim 44, wherein generating the three-dimensional model for integration into the object recognition system includes generating the three-dimensional model for integration into a target recognition system.

64. A method for modeling an object in software, comprising:  
generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives, including:  
generating a preliminary three-dimensional geometry from object from the images to define a three-dimensional space; and  
generating the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and  
generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.

65. The method of claim 64, wherein generating the preliminary three-dimensional geometry includes:

selecting a plurality of points in each of the two-dimensional images;

calibrating the relationship between the images from selected points that are co-located in more than one of the two-dimensional images; and

mapping the selected points in the calibrated two-dimensional images into the three-dimensional space.

66. The method of claim 65, wherein mapping the selected points into the three-dimensional space includes:

defining the three-dimensional space from the calibrated relationships between the images; and

placing the selected points into the three-dimensional space using the co-located points as references between the images.

67. The method of claim 65, wherein generating the final three-dimensional geometry includes:

selecting a second plurality of points in each of the two-dimensional images; and

mapping the second plurality of selected points into the three-dimensional space.

68. The method of claim 64, wherein generating the three-dimensional model includes generating a three-dimensional model of LADAR returns from the object.

69. The method of claim 68, wherein generating the three-dimensional model of the LADAR returns for integration into the object recognition system includes generating the three-dimensional model of the LADAR returns for integration into a target recognition system.

70. A program storage medium encoded with instructions that, when executed by a computing device, perform a method for modeling an object in software, the method comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives, including:

generating a preliminary three-dimensional geometry from object from the images to define a three-dimensional space; and

generating the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and

generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.

71. The program storage medium of claim 70, wherein generating the preliminary three-dimensional geometry in the method includes:

selecting a plurality of points in each of the two-dimensional images;

calibrating the relationship between the images from selected points that are co-located in more than one of the two-dimensional images; and

mapping the selected points in the calibrated two-dimensional images into the three-dimensional space.

72. The program storage medium of claim 70, wherein generating the three-dimensional model in the method includes generating a three-dimensional model of LADAR returns from the object.

73. A computer, comprising:

a processor;

a bus system;

a storage with which the processor communicates over the bus system; and

a software application residing in the storage and capable of performing a method for modeling an object in software upon invocation by the processor, the method comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives, including:

generating a preliminary three-dimensional geometry from object from the images to define a three-dimensional space; and

generating the three-dimensional geometry from the images, the three-dimensional geometry being defined within the three-dimensional space; and

generating a three-dimensional model from the three-dimensional geometry for integration into an object recognition system.

74. The programmed computer of claim 73, wherein generating the preliminary three-dimensional geometry in the method includes:

selecting a plurality of points in each of the two-dimensional images;

calibrating the relationship between the images from selected points that are co-located in more than one of the two-dimensional images; and

mapping the selected points in the calibrated two-dimensional images into the three-dimensional space.

75. The programmed computer of claim 73, wherein generating the three-dimensional model in the method includes generating a three-dimensional model of LADAR returns from the object.

76. A method for modeling an object in software, comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives; and

generating a three-dimensional model of a LADAR return from the three-dimensional geometry for integration into an object recognition system.

77. The method of claim 76, wherein generating the three-dimensional model of the LADAR returns for integration into the object recognition system includes generating the three-dimensional model of the LADAR returns for integration into a target recognition system.

78. The method of claim 76, wherein generating the three-dimensional model from the three-dimensional geometry includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.

79. A program storage medium encoded with instructions that, when executed by a computing device, perform a method for modeling an object in software, the method comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives; and

generating a three-dimensional model of a LADAR return from the three-dimensional geometry for integration into an object recognition system.

80. The program storage medium of claim 79, wherein generating the three-dimensional model of the LADAR returns for integration into the object recognition system in the method includes generating the three-dimensional model of the LADAR returns for integration into a target recognition system.



81. The program storage medium of claim 79, wherein generating the three-dimensional model from the three-dimensional geometry in the method includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.

82. A programmed computer, comprising:

a processor;

a bus system;

a storage with which the processor communicates over the bus system; and

a software application residing in the storage and capable of performing a method for modeling an object in software upon invocation by the processor, the method comprising:

generating a three-dimensional geometry of the object from a plurality of points obtained from a plurality of images of the object, the images having been acquired from a plurality of perspectives, including:

generating a three-dimensional model of a LADAR return from the three-dimensional geometry for integration into an object recognition system.

83. The programmed computer of claim 82, wherein generating the three-dimensional model of the LADAR returns for integration into the object recognition system in the method includes

generating the three-dimensional model of the LADAR returns for integration into a target recognition system.

84. The programmed computer of claim 82, wherein generating the three-dimensional model from the three-dimensional geometry in the method includes:

rotating the three-dimensional geometry; and

generating a plurality of synthetic signatures of the model from a plurality of perspectives at the three-dimensional geometry is rotated.